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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
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ART UNIT	PAPER NUMBER
2813	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/758,815	KITAOKA ET AL.	
	Examiner	Art Unit	
	Sonya D. McCall-Shepard	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23,30 and 31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23,30 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

This office action is in response to applicant's response filed on 16 October 2007.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

2. Claims 1-2 and 30 are rejected under 35 U.S.C. 102(e) as anticipated by Kidoguchi et al. (US 6,720,586).

With regard to claims 1 and 30, Kidoguchi et al. disclose a method of manufacturing a Group III nitride substrate comprising: forming a Group III nitride

layer including gaps 12*c* on a substrate 11; bringing a surface of the Group III nitride layer into contact with a melt containing alkali metal and at least one Group III element selected from gallium, aluminum and indium in an atmosphere containing nitrogen, to make at least one Group III element and the nitrogen react with each other to grow Group III nitride crystals on the Group III nitride layer (col. 17, lines 53-60); and separating a part including the substrate 11 and a part including the Group III nitride crystals 14 from each other in vicinities of the gaps 12*c* (fig. 4).

With regard to claim 2, Kidoguchi et al. disclose the Group III element is gallium and the Group III nitride crystals are GaN crystals (col. 16, lines 25-26).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 3, 5-11, 13, 16-23 and 31 are rejected under 35 U.S.C. 103(a) as obvious over Kidoguchi et al. (US 6,720,586).

With regard to claims 3 and 31, Kidoguchi et al. teach an atmosphere containing nitrogen is a pressurized atmosphere (col. 17, lines 54-55).

With regard to claim 5, Kidoguchi et al. teach in figs. 1 and 14 forming a first semiconductor layer on the substrate; forming convex portions by partially removing the first semiconductor layer; and forming the Group III nitride layer having gaps in its portions other than the convex portions by growing a second semiconductor layer from upper surfaces of the convex portions of the first semiconductor layer, wherein in the process the first semiconductor layer and the second semiconductor layer are separated from each other at the upper surfaces of the convex portions. Although Kidoguchi et al. teach a first semiconductor layer expressed GaN and not by a composition formula of $Al_uGa_vIn_{1-u-v}N$ (wherein $0 \leq u \leq 1$ and $0 \leq v \leq 1$), and the second semiconductor layer being expressed as AlGaN and not by a composition formula of $Al_xGa_yIn_{1-x-y}N$ (wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$), it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the $Al_uGa_vIn_{1-u-v}N$ (wherein $0 \leq u \leq 1$ and $0 \leq v \leq 1$) as the first semiconductor layer and the second semiconductor layer expressed by a

composition formula of $Al_xGa_yIn_{1-x-y}N$ (wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$), since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art MPEP 2144.05.

With regard to claim 6, Kidoguchi et al. teach an upper C-plane surface (col. 17, lines 53-55).

With regard to claim 7, Kidoguchi et al. teach a method wherein the convex portions are formed in stripes (col. 17, lines 30-32).

With regard to claim 8, Kidoguchi et al. teach a method wherein the concave portions that are portions other than the upper surfaces of the convex portions are covered with a mask film (col. 17, lines 38-40).

With regard to claim 9, Kidoguchi et al. teach a method wherein the mask film contains at least one selected from a group consisting of silicon nitride, oxide silicon, nitride oxide silicon, aluminum oxide, aluminum nitride oxide, titanium oxide, zirconium oxide and niobium oxide (col. 17, lines 38-40).

With regard to claim 10, Kidoguchi et al. teach a method wherein the mask film is made of high melting metal or a high melting metallized material (col. 20, lines 42-45).

With regard to claim 11, Kidoguchi et al. teach a method wherein the mask film contains at least one selected from a group consisting of tungsten, molybdenum,

niobium, tungsten silicide, molybdenum silicide and niobium silicide (col. 20, lines 42-49).

With regard to claim 13, Kidoguchi et al. teach a sapphire substrate (11) (col. 16, lines 14-16).

With regard to claim 16, Kidoguchi et al. teach forming a first semiconductor layer expressed by a composition formula of GaN (12a) equivalent to $Al_uGa_vIn_{1-u-v}N$ (wherein $0 \leq u \leq 1$ and $0 \leq v \leq 1$), on the substrate (11); and forming concave portions to be gaps by partially removing the first semiconductor layer to expose portions of the substrate and thereby forming remaining portions into convex portions, wherein Group III nitride crystals (14A) are grown on the surfaces of the convex portions formed in the process (figs. 1 and 14).

With regard to claim 17, Kidoguchi et al. teach forming a mask film (13) patterned on the substrate and forming a first semiconductor layer with a convex shape on each of portions of the substrate that are not covered with the mask film to allow concave portions to be gaps, the first semiconductor layer being expressed by a composition formula of GaN (12a) equivalent to $Al_uGa_vIn_{1-u-v}N$ (wherein $0 \leq u \leq 1$ and $0 \leq v \leq 1$), and the concave portions being portions where the first semiconductor layer with the convex shape has not been formed, wherein the Group III nitride crystals are grown on a surface of the first semiconductor layer formed in the process (figs. 1, 14).

With regard to claim 18, Kidoguchi et al. teach a method of manufacturing a Group III nitride substrate comprising: forming a Group III nitride layer including gaps 12*c* on a substrate 11; bringing a surface of the Group III nitride layer into contact with a melt containing alkali metal and at least one Group III element selected from gallium, aluminum and indium in an atmosphere containing nitrogen, to make at least one Group III element and the nitrogen react with each other to grow Group III nitride crystals on the Group III nitride layer (col. 17, lines 53-60); and separating a part including the substrate 11 and a part including the Group III nitride crystals 14 from each other in vicinities of the gaps 12*c* (fig. 4); wherein in the process the group III nitride layer including gaps includes a semiconductor layer expressed by a composition formula $Al_xGa_yIn_{1-x-y}N$ (wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$), and after forming the semiconductor layer, the gaps are formed in the semiconductor layer or at the surface of the semiconductor layer through a temperature programmed heat treatment carried out in an atmosphere of a mixture of ammonia and nitrogen (col. 22, lines 7-9). Dry etching is an equivalent substitution for heat treatment, because dry etching involves heat.

With regard to claim 19, Kidoguchi et al. disclose the claimed invention except the Group III nitride layer including gaps is a semiconductor layer expressed by a composition formula of $Ga_xIn_{1-x}N$ (wherein $0 \leq x \leq 1$). It would have been obvious to one having ordinary in the art at the time the invention was made to use the Group III

nitride layer including gaps is a semiconductor layer expressed by a composition formula of $Ga_xIn_{1-x}N$ (wherein $0 \leq x \leq 1$) (col. 1, lines 35-50).

With regard to claim 20, Kidoguchi et al. do not teach a temperature programmed heat treatment carried out at a programming rate of 50 to 100°C/min. Nonetheless, the choice of temperature is considered an obvious optimization to one of ordinary skill in the art at the time of the invention. The ranges claimed do not achieve any unexpected results over the prior art and are considered obvious. In re Aller, 105 USPQ 233. (CCPA 1955).

With regard to claim 21, Kidoguchi et al. teach the method wherein a cycle of gaps is at least 30 μm (col. 22, lines 1-2).

With regard to claims 22 and 23, Kidoguchi et al. teach the claimed method except for a cycle of the gaps is at least 50 μm and at least 100 μm. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a cycle of gaps at least 50 μm and a cycle of gaps at least 100 μm, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidoguchi et al. (US 6,720,586) as applied to claim 1 above, and further in view of Koike et al. (US 6,471,770).

With regard to claim 4, Kidoguchi et al. discloses the claimed invention except a separation carried out using stress generated by a difference in coefficient of linear expansion between the substrate and the Group III nitride crystals. Koike et al. teach a GaN layer formed on a substrate layer that is separated apart using stress from thermal distortion which is a difference in coefficient of linear expansion between the substrate and the Group III nitride layer (col. 3, lines 55-58). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Koike et al. in the method of Kidoguchi et al. The motivation for doing so is to use a technique that when the sample is cooled they are automatically separated from each other.

7. Claims 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kidoguchi et al. (US 6,720,586) in view of Sarayama et al. (US 6,592,663).

With regard to claim 12, Kidoguchi et al. teach forming convex portions by processing a surface of a substrate and growing a Group III nitride layer from upper surfaces of the convex portions to form a seed crystal substrate having gaps formed between the substrate and the Group III nitride layer (figures 4, col. 17, lines 53-60). Sarayama et al. teach bringing a surface of the Group III nitride layer into contact with a melt containing alkali metal and at least one Group III element selected from gallium, aluminum and indium in a pressurized atmosphere containing nitrogen, to make at least one Group III element and the nitrogen react with each other to grow Group III

nitride crystals on the Group III nitride layer as set forth at column 5, lines 45-66 and figures 3, 4A-4B and Kidoguchi et al. teach separating a part including the substrate and a part including the Group III nitride crystals from each other in vicinities of the gaps (col. 24, lines 26-31). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Sarayama et al. in the method of Kidoguchi et al. The motivation for doing so is to grow the Group III nitride crystal using a well known technique in the art.

With regard to claim 14, Sarayama teaches wherein the alkali metal is at least one selected from sodium, lithium and potassium (figures 4A and 4B).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidoguchi et al. (US 6,720,586) and Sarayama et al. (US 6,592,663) in view of D'Evelyn et al. (US 2004/0124434).

With regard to claim 15, Kidoguchi et al. and Sarayama et al. teach the claimed invention but do not teach the method wherein the melt further contains alkaline earth metal. However, D'Evelyn et al. teach that it is known to use a method wherein the melt comprises alkali and alkaline-earth nitrides. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the process as taught by D'Evelyn et al. in the process of Kidoguchi et al. et al. and Sarayama et al., since D'Evelyn et al. state in paragraphs [0030] and [0031] that such a modification in

the methodology is preferred because of easier process control and higher quality crystals.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sonya D. McCall-Shepard whose telephone number is 571-272-9801. The examiner can normally be reached on Monday - Friday 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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